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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Vehicle Suspension Systems

We, ANDRE ROBERT MAROT, a French Citizen, of 39 rue d'Alembert à Villeneuve-St-Georges, Seine, France and PNEUMATIQUES CAOUTCHOUC MANUFACTURE & PLASTIQUES KLEBER COLOMBES (formerly PNEUMATIQUES & CAOUTCHOUC MANUFACTURE KLEBER COLOMBES), a French Body Corporate of Place Valmy, Colombes, Seine, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to vehicle suspension systems, particularly for automobiles, and has as an object, improvements therein.

Vehicle suspensions are continuously evolving and being developed because any suspension must take into account the weight and dimensions of the vehicle, its load capacity, the power of its engine and of its braking system, the kind of steering and also the general state of the roads. Due to the many facets of the problem, there have been proposed a large number of solutions which are all more or less the product of a compromise between differing desiderata. By and large the suspension systems currently used are of the mechanical type with or without supplementary stabilising or damping devices which can be pneumatic, mechanical or hydraulic; some suspension systems are specifically pneumatic or hydraulic. Whatever the solution used, even the best of suspension systems still have serious drawbacks, particularly when cornering, when the vehicle rolls towards the outside of the corner, and this is uncomfortable for the passengers and can lead to serious accidents.

Automobile vehicles have been fitted for a long time with so-called "independently sprung" wheels: this makes a contribution towards the improvement of the comfort and road holding and can be adapted to all types of suspension whether by torsion bars, semi-elliptic springs and wish bones (triangulated lever), swinging half axles and helical springs, or floating axles, the body being fixed upon an axle beam or other transverse member carrying said suspension members. But, with or without damping devices, all these systems suffered from at least some of the above-mentiond drawbacks.

The analysis of the displacement of a vehicle along a curve shows that, even when fitted with the best known suspensions, during cornering and even more clearly when it is travelling at high speed, it undergoes the action of centrifugal force, which tends to displace it in the opposite direction to that of the curve, and it also undergoes the force of inertia which tends to make it pursue its original path. It is known that centrifugal force and inertia are proportional to the weight of the vehicle, to its speed and to the radius of curvature of the bend.

It is a specific object of the present invention to provide a vehicle-suspension system which minimises these drawbacks, but which may be fitted without difficulty to conventional vehicles, and allows shock absorbers to be dispensed with if desired, but which nevertheless can be made at a cost not exceeding that of conventional suspensions.

The invention consists in a vehicle suspension system in which each wheel of one or more pairs of wheels is connected to an axle beam or other transverse member, extending between the or each pair of wheels, by links, one of which is pivoted to a lever pivoted to the transverse mem-

bar; and in which each of said one links or said levers is also connected to the associated transverse member by resilient means and the vehicle body is pivoted to and carried by the levers.

Each lever may be pivoted to the associated transverse member at a point between the pivots connecting the lever to the said one link and the vehicle body.

Each resilient means may comprise a helical spring, which may be pivotally connected to the transverse member and to the said one link and be stretched and compressed between these pivotal connections. Alternatively, each resilient means may comprise a torsion bar mounted on the associated transverse member substantially parallel to the pivot axis of the associated lever on said transverse member. In this case, each torsion bar may be connected to the associated lever by two further levers which are pivotally interconnected and one of which is pivoted to the lever whilst the other is rigidly fixed to the torsion bar.

When the resilient means are at rest, their stress axes may be symmetrically disposed with respect to the longitudinal plane of symmetry of the vehicle, i.e., these axes are inclined at the same angle on both sides of the longitudinal axis of the vehicle. This angle is determined by the shape and dimensions of the links, also the lengths of the levers, taken between the pivots connecting each lever to the associated link and transverse member, and finally by the travel allowed for the resilient means.

Hydraulic, pneumatic or other types of shock-absorber may be used with the suspension system according to the invention, these shock-absorbers being arranged separately or in combination with the resilient means referred to above.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show two specific embodiments thereof by way of example and in which:—

Figure 1 shows a front elevation of a first embodiment.

Figure 2 shows a front elevation of the position taken up by the device in Figure 1 when cornering.

Figures 3 and 4 show front elevations, corresponding respectively to Figures 1 and 2, of a modification in which the flexible members are torsion bars, and

Figure 5 shows a section on a large scale along the line V-V of Figure 4.

Referring to the embodiment shown in Figures 1 and 2, the front wheels 1 and 2 of an automobile vehicle, having a body represented schematically at 3, are connected respectively to opposite ends of an axle beam or other transverse member 6 extending between the wheels by links in the form of lower bearing rods 4_1, 4_2 and upper bearing rods 5_1, 5_2 articulated in any desired fashion to the corresponding wheel. The lower bearing rods 4_1, 4_2 are articulated at their other ends, at 4^a to the transverse member 6. Towards each end of the transverse member 6 there is articulated an angled lever 7_1, 7_2. The body 3 is pivoted to one end of each lever at 8_1, 8_2 whilst the other end of each lever is articulated at 10_1, 10_2 to the adjacent upper bearing rod 5_1, 5_2. Between the said bearing rods 5_1, 5_2 and the transverse member 6 are mounted so that they pivot at their ends, two helical springs 11_1, 11_2, each of which are provided with a hydraulic shock absorber 12.

The assembly is preferably exactly the same for the rear wheels of the vehicle.

When the vehicle fitted as described is following a straight line, the suspension members occupy the positions shown in Figure 1. When the vehicle is entering a curve to the right, the lever 7_1 is pushed back towards the left of the drawings; thus the spring 11_1 is compressed, i.e. it shortens, between the bearing rod 5_1 and the transverse member 6, and also the wheel 1 inclines towards the right. At the same time the lever 7_2 stretches the spring 11_2 between the bearing rod 5_2 and the transverse member 6 and causes the wheel 2 to incline towards the right but at a smaller angle of inclination than that of the wheel 1. The body 3 is thus inclined towards the centre of the curve, while lowering the centre of gravity in the same direction. Therefore the effects of centrifugal force on the passengers is diminished, compared with conventional vehicles and on the other hand road holding is improved since the wheels, in sloping, in fact grip the ground, thus avoiding any tendency to skid.

Referring now to Figures 3, 4 and 5, the body 3 is pivoted at 13_1, 13_2 to levers 14_1, 14_2 which are articulated at 15_1, 15_2 to the upper bearing rod 5_1, 5_2 and at intermediate points 16_1, 16_2 to the transverse member 6. Two levers 17_1, 17_2 are articulated at one end to the pivot 13_1, 13_2 and at their other ends, at 18_1, 18_2, to the adjacent ends of levers 21_1, 21_2. The other ends 19_1, 19_2 of the latter are connected to the transverse member 6 by means of torsion bars 20_1 and 20_2 to which the levers 21_1, 21_2 are rigidly fixed and which are coaxial with the articulations of the lower bearing rods 4_1, 4_2.

The action of the embodiment illustrated in Figures 3, 4 and 5 is the same as that of Figures 1 and 2.

Thus it may be seen that the suspension system according to the present invention has as its practical effect, by the use of centrifugal forces and of inertia, the hardening

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of the suspension springs in the opposite direction to the direction of the bend and at the same time has the effect of inclining the wheels in the direction of the bends. Thus it offers the advantage which has been sought for a long time, but not yet obtained in such a simple way, of almost entirely eliminating the risks of turning over or skidding due to undesirable reactions in the known flexible suspensions when corners are taken at great speed. Thus it allows faster cornering with more safety and comfort without losing the vehicle's comfortable "feel" when travelling in a straight line or over bad roads. Finally it can be adapted without particular difficulty to vehicles which are already in service or to vehicles under construction.

WHAT WE CLAIM IS:—

1. A vehicle suspension system in which each wheel of one or more pairs of wheels is connected to an axle beam or other transverse member, extending between the or each pair of wheels, by links, one of which is pivoted to a lever pivoted to the transverse member, and in which each of said one links or said levers is also connected to the associated transverse member by resilient means and the vehicle body is pivoted to and carried by the levers.

2. A system as claimed in claim 1, in which each lever is pivoted to the associated transverse member at a point between the pivots connecting the lever to the said one link and the vehicle body.

3. A system as claimed in claim 1 or 2 in which each resilient means comprises a helical spring.

4. A system as claimed in claim 1 or 2, in which each resilient means comprises a torsion bar mounted on the associated transverse member substantially parallel to the pivot axis of the associated lever on said transverse member.

5. A system as claimed in claim 4, in which each torsion bar is connected to the associated lever by two further levers which are pivotally interconnected and one of which is pivoted to the lever whilst the other is rigidly fixed to the torsion bar.

6. A system as claimed in any one of the preceding claims, in which when the resilient means are at rest, their stress axes are symmetrically disposed with respect to the longitudinal plane of symmetry of the vehicle.

7. A vehicle suspension system constructed and adapted to operate substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

8. A vehicle suspension system constructed and adapted to operate substantially as hereinbefore described with reference to Figures 3, 4 and 5 of the accompanying drawings.

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Fig.1

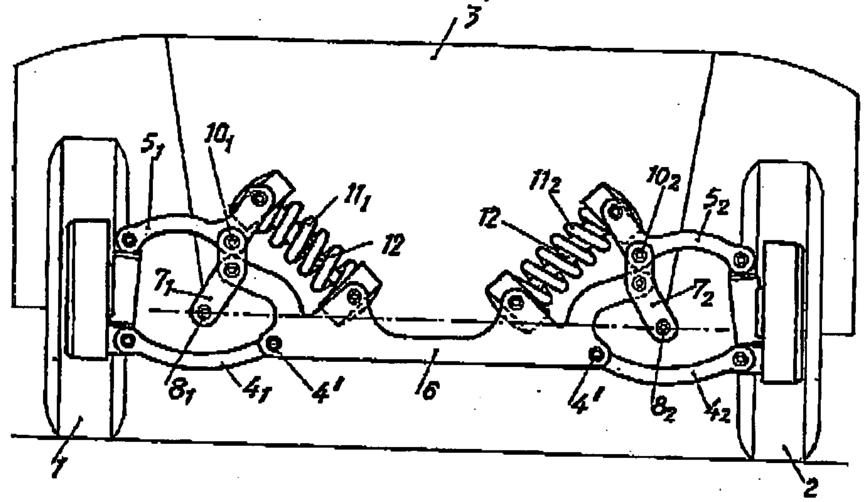
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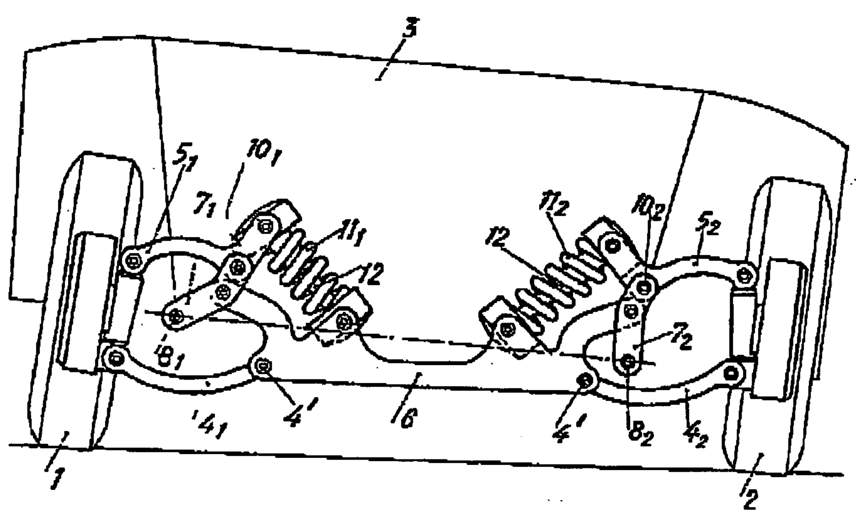
Fig.2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SHEETS 1 & 2

Fig. 3

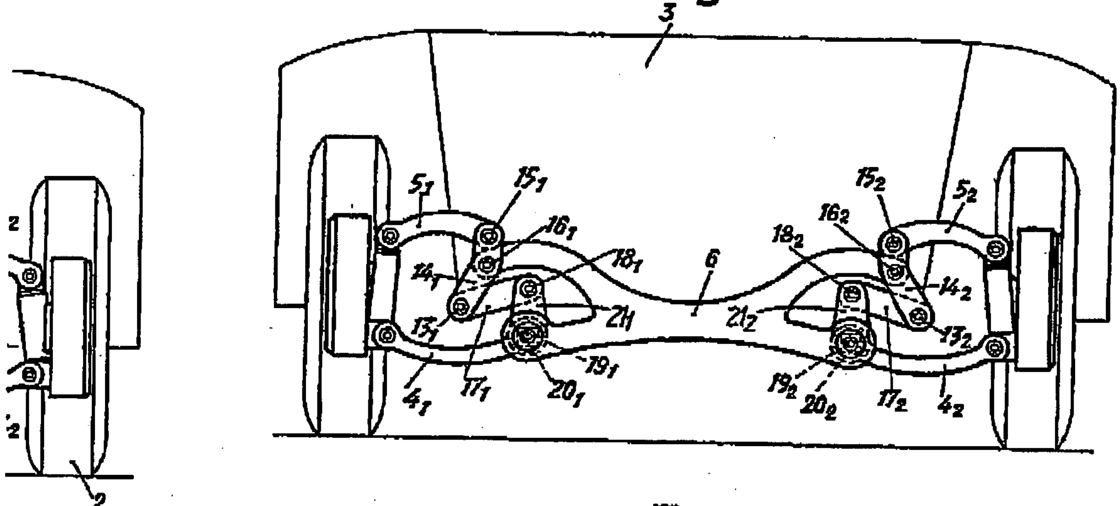
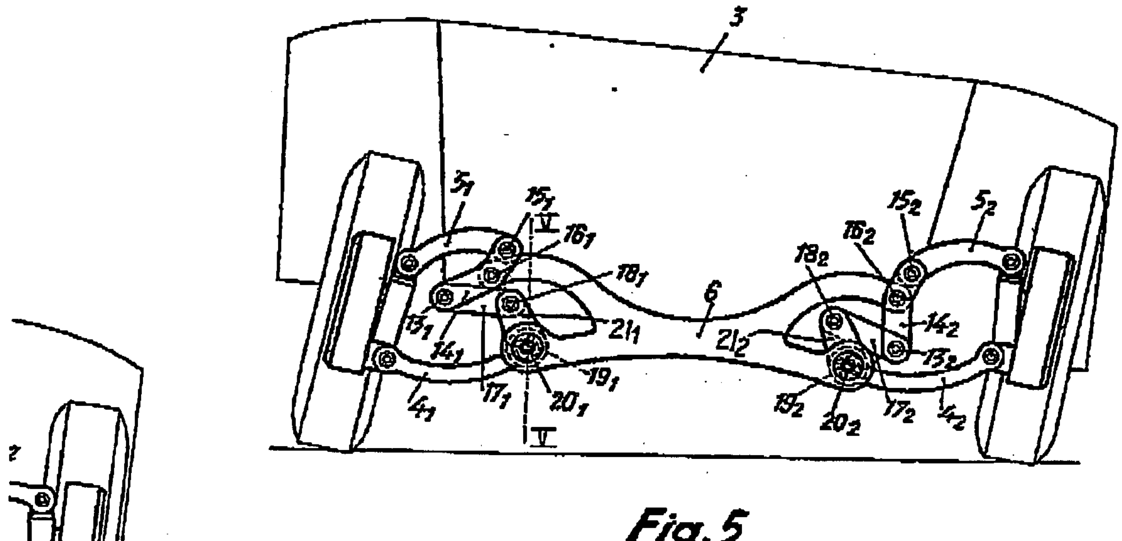


Fig. 4



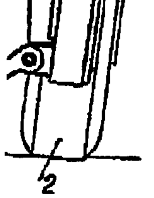
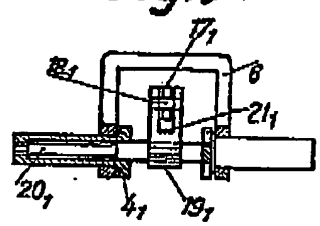


Fig. 5



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SHEETS 1 & 2

Fig. 1

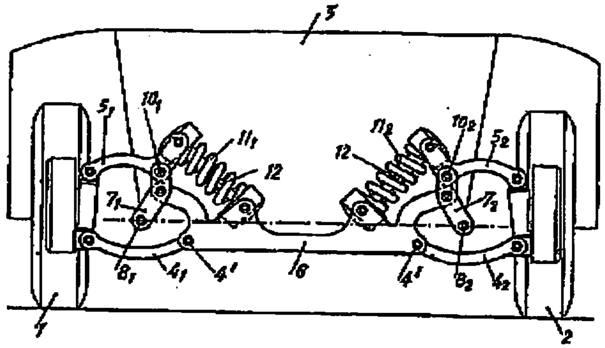

Fig. 2

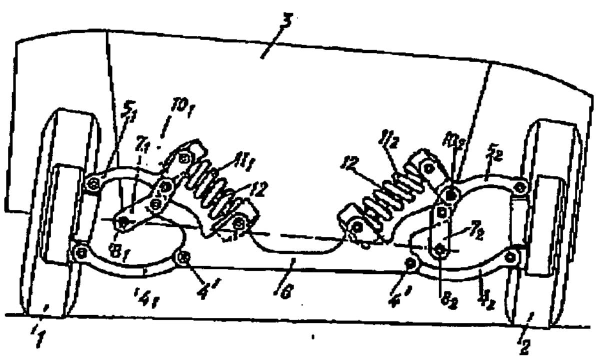

Fig. 3

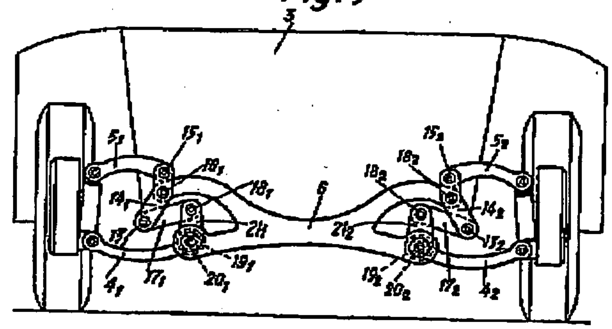

Fig. 4

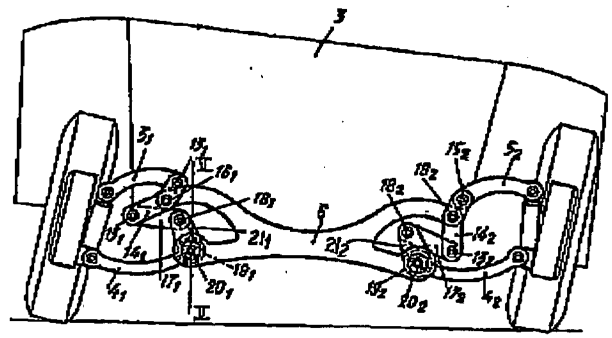

Fig. 5